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ABSTRACT

A study tested whether an intervention involving collaboration and the integration of reading and writing would build sixth-grade students' schemata for comparison/contrast and cause/effect text. Subjects were 76 students in 7 sixth-grade classes in 2 urban middle schools. Four of the classes were randomly chosen as the treatment group. For the control group, the teacher provided an interest-building introduction to the topic in the reading passage and gave the students an opportunity to predict the passage contents. Data were collected from pretests, interim tests, posttests, and sustained effects tests. Results indicated that (1) students in the treatment group closely approached full awareness of the comparison/contrast structure and achieved high partial awareness of the cause/effect structure; (2) the treatment group showed a small but consistent upward trend on recall protocols for the comparison/contrast structure, while the control group declined during the intervention; (3) for cause/effect, the treatment group showed an upward growth pattern followed by a decline on the sustained effects test, while the control group scored consistently below its initial status level until the sustained effects test when it showed a slight increase over its initial status score; (4) treatment group students experienced a greater increase of the number of idea units over the course of the intervention than did the control group; and (5) students' initial awareness of structure did not influence their rate of growth in the percentage of top-level idea units remembered. (Contains 71 references and 4 figures of data.) (RS)

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COLLABORATION AND THE READING-WRITING RELATIONSHIP: IMPLICATIONS FOR BUILDING SCHEMATA FOR EXPOSITORY TEXT

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Collaboration and the Reading-Writing Relationship: Implications for Building Schemata for Expository Text

The study presented in this paper tested whether an intervention involving collaboration and the integration of reading and writing would build sixth-grade students' schemata for two expository text structures, comparison/contrast and cause/effect. It also examined whether the effectiveness of the intervention would vary as a factor of constraints within the reader such as reading skill level, initial level of text structure awareness and degree of familiarity with the content of the passage.

Theoretical Perspectives

The design of this study represents an integration of findings from three areas of research: the role of text structure schemata in the processing of expository text, the reading-writing relationship, and the instructional implications of socially-constructed knowledge.

Text structure and schemata for text structure. The rhetorical or logical relations among the ideas in a text, such as *comparison and contrast* or *cause and effect*, and the subordination of some ideas to others form a text's structure (Englert & Hiebert, 1984; Meyer & Rice, 1984). The representation of these text structures in memory is in the form of schemata, abstract units into which all knowledge is packaged or organized (Rumelhart, 1984; Schallert, 1982;). Text structure schemata, then, are the abstract, mental units which readers and writers have about the organizing principles of texts (Clafee & Curley, 1984).

Implications for Text Processing

Comprehension. Researchers have found that knowledge of text structure aids comprehension (Armbruster, 1984; Englert & Hiebert, 1984; Kintsch & Yarbrough, 1982; Meyer, 1975; Roller, 1990). Findings show poor

comprehenders appear to be less sensitive to text structure than good comprehenders. Good comprehenders, on the other hand, appear to be more aware of text organization and how it affects meaning (Kletzien, 1991). They are able to distinguish important ideas from details subordinate to main ideas (Englert & Thomas, 1987; Penning & Raphael,1992). Students who are sensitive to text structure tend to get the "gist" of a passage whereas those who are not tend to remember random ideas or details. This finding suggests that knowledge of text structure provides readers with strategies, such as the structure strategy, to use in comprehending text (Richgels, McGee, Lomax & Sheard, 1987). That is, they have the means for distinguishing major text-based relationships among propositions and "chunking" them in memory (Meyer 1984b).

Recall of Material Read. By facilitating the macroprocessing of text, text structure schemata appear also to play a major role in the recall of material. Lack of text structure schemata makes it difficult for readers to form and store a coherent representation of the text in memory, thus affecting their ability to recall information from the text (Armbruster, Anderson & Ostertag, 1987; Englert and Hiebert, 1984; McGee and Richgels, 1985; Penning & Raphael, 1992). Evidence of this can be found in subjects' recall protocols. Examinations of the organization of the recall protocols indicates that good comprehenders use the author's top level structure to store text in memory (Meyer, Brandt & Bluth, 1980). Their recall protocols are written in accordance with the author's top level structure. Those who do not use text structure schemata generally produce recall protocols lacking cohesiveness and a main idea. Gordon (1990) found that when students become sufficiently aware of and gain control over structure during reading, they use it as a "plan" for recall.

A number of researchers have found that schemata for text structure can be developed through instruction and that knowledge gained through instruction aids expository text processing (Armbruster, Anderson, & Ostertag, 1987; Berkowitz, 1986; Gordon, 1990 a, b; Horowitz, 1985a; Meyer, 1984, 1977; Taylor & Beach, 1984). Gordon (1990a) states that "in specific contexts students who have received direct instruction in expository text structure are aware of and use text structure when reading, writing, speaking, and a few even in activities and events in everyday life" (p. 69). Because of the importance of being able to comprehend and retain information from text books as well as produce expository writing, instruction in the recognition of text structure appears not only to be important but efficacious. The issue is not *if* text structure instruction is effective but rather what type of instruction is most effective (Englert & Hiebert, 1984; Horowitz, 1985 a and b; McGee, 1982).

Reading-writing interventions. Many theorists hypothesize that as language processes reading and writing are inextricably interrelated. The influence of this interrelationship is borne out in literature surveys by Moore (1993), Belanger (1987) and Stotsky (1984) which revealed a high correlation between good readers and good writers and between poor readers and poor writers. Each of their surveys found that better writers tend to be better readers, that better writers read more than poorer writers, and that better readers produce syntactically more complex writing than poorer readers.

Studies looking specifically at the relationship between good and poor readers and writers and their use of top level structures have found patterns that reflect the reading-writing relationship in general. Taylor and Beach (1984) found that skill in using text structure in writing expository text not

only resulted in better organized prose but it also appeared to impact positively on one's ability to recall text after reading. Similarly, McGee's (1982) discovered that students who not only noted structure while reading but also produced structure in their own writing were even better comprehenders (p. 235). Gordon (1990b) found that students who used text structure in forming a macrostructure when reading had a better understanding of the need to incorporate it into their own writing. It appears good readers use top-level structure to frame their writing while poor readers fail to use any discernable organizing structure when they write (Penning & Raphael, 1992). These findings suggest the importance of capitalizing upon the reading-writing relationship in the design text structure interventions.

Collaboration and text structure interventions. The elaboration of Vygotsky's theories regarding the social construction of knowledge to educational settings has further implications for the design of interventions to build text structure. According to Vygotsky, learning at first is interpsychological, occuring in interactions with other. In order for any mental function to move to a higher level, the socially shared knowledge must go through a gradual process of internalization in which the interpsychological becomes intrapsychological (Vygotsky, 1978; Wertsch, 1991). The process of knowledge internalization is the movement of talk related to any activity from outer socialized speech inward in order to serve an intrapersonal function. This inner speech enables the individual to regulate cognitive activity. Attainment of this point in the learning of any skill is the goal of instruction. Instruction toward the goal creates what Vygotsky calls the zone of proximal development (ZPD), "the distance between the actual developmental level as determined by independent problem solving and the

level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (Vygotsky, 1978, p. 86). The metaphor of the ZPD provides the rationale for a collaborative-based instructional design because instruction so framed enables students to participate in strategic activity without understanding it completely (Bayer, 1990; Palincsar & David, 1991).

The talk which occurs in collaborative classrooms "is the catalyst that relates reading to writing" (Britton, 1989). According to Chafe (1989) "writing profits from being taught against a meaningful background of reading and vice versa . . . writing and reading become more meaningful still when they are placed in a still larger context of overall language use" (p. 168). Collaborative practices such as *apprenticeship modeling* in which the teacher or "master" models for and scaffolds the student or "novice," *procedural facilitation* in which the teacher not only models the desired behaviors but provides prompts such as graphic organizers, and *peer collaboration* in which students in either expert/novice or novice/ novice combinations help each other, can be used to frame reading and writing activities for text structure development (Bayer, 1990; Bereiter & Scadamalia, 1987; Daiute & Dalton, 1993; Forman & Cazden, 1985.)

Goals for this study. As previously mentioned, research has shown that designing interventions to increase levels of text structure awareness is both necessary and viable. Furthermore, it indicates that interventions which purposefully integrate reading and writing within a collaborative setting have the potential for developing schemata for text structure schemata and thus improve students' processing of expository text. The questions this study sought to answer were:

1. What is the effect, as indicated by measures of recall and comprehension, of a collaborative, integrated reading and writing intervention for building schemata for top-level expository text structures?

2. Does the effect of the intervention vary according to (a) the prior ski level of readers, (e.g, is it more effective for good, average or poor readers? and (b) the student's initial level of text structure awareness and/or passag familiarity?

Method and Design

This study was a quasi-experimental reading treatment involving seven classes of sixth-grade students from two urban middle schools. From the seven classes four were randomly chosen to participate in an intervention designed to build schemata for two expository text top-level structures, *comparison/contrast* and *cause/effect*. The three remaining classes of sixth grade students became the control group. Multiwave testing data was collected for each structure and analyzed from a multilevel and longitudinal perspective using a hierarchical linear model.

Participants

Students. The participants in the study were 76 urban middle school students enrolled in reading during the second trimester of the school year. The heterogeneously grouped reading classes met for forty-two minutes every other day for one trimester of the year or nine weeks. School administrators formed the heterogeneous groups following a non-systematic district-wide plan for the middle schools which called for balancing groups by gender, ethnic group and reading levels.

Teachers. Each middle school had its own certified reading specialist who taught all sections of reading for grades 6, 7, and 8. The teachers received two days of training plus frequent follow-up consultation during the study.

Reading skill levels. Students in these schools are tested yearly in the fall on the Degrees of Reading Power Test (DRP) which comprises a section of the Connecticut State Mastery Test (CMT) . The normed NCE's specific to the Connecticut test was the metric used for testing for equivalence between the groups and for analyzing and reporting data.

The mean score on the Degrees of Reading Power section of the Connecticut Mastery Test for Grade 6 for all the subjects was 55 NCE's (SD=20.44). The mean for the Control Group was 54.06 NCE's (SD=20.67) while the mean for the Treatment Group was 55.76 NCE's (SD=20.48). A two-sample T-test failed to reject the null hypothesis that the means of the two groups were identical (t=-0.36, p<.72).

Procedures

Instruction. Students receiving the treatment participated in an intervention designed to teach two top-level structures, *comparison and contrast* and *cause and effect.* After introducing the concept of top-level structures verbally and through a participatory experience using interlocking plastic building blocks, each teacher modeled how to write a passage from information contained in a comparison and contrast graphic organizer. From graphic organizers on overhead transparencies, students then wrote passages based on these organizers. They wrote the first one as a whole class, the next in small groups and the third individually.

During the second phase the mode of thinking was reversed. Instead of writing from an organizer, the teacher modeled how they could make their own graphic organizers from a passage. Once again students completed an organizer first as a whole class, then in small groups and lastly individually.

For the third and final phase students in small groups designed posters for display which described the comparison and contrast structure. Each group

explained its poster to the class following which the class voted on the one they felt best represented the struture. Once instruction for the comparison and contrast structure was completed, the same procedure was applied to the causation structure.

The procedure chosen for the controls was to have teachers provide an interest-building introduction to the topic in the passage, give students an opportunity to predict the passage contents and introduce any difficult vocabulary words. Students then read the passage and answered a set of questions both orally and in writing. After writing their answers, they participated in a class discussion about the answers. None of the questions directed attention to the structural aspect of the passages. The only overlap in activities was the introduction to each of the passages prior the activities engaged in by either group. The intervention was a modification of one developed by Richgels and McGee (1989).

Materials. Several passages for the assessment measures and for instruction were revisions of passages taken from the students' sixth grade content area textbooks and magazines. Because of the difficulty of finding enough passages to meet the preordained specifications, I had to construct additional passages using topics covered in their content area courses as a foundation. Both the original and the revised passages were between 175-200 words in length and were at sixth and seventh grade readability levels.

I also designed graphic organizers for students to use for the writing component of the intervention as well as graphic organizer templates for the passages in the reading component.

Testing. Test data was collected for both the treatment group and the controls at multiple time points and included a pretest, interim test, posttests

and sustained effects tests.. These multiple testing sessions provided five waves of data for each structure for measuring growth over time.

Scoring

Measures of structure awareness and percentage of idea units recalled. For the structure awareness measure, students were requested to read a passage written in one of the two structures and then write everything that they remembered from reading the passage. The theoretical premise for this form of measurement was that structure- aware students would replicate the structure of the passage in their recall protocols while those who were not aware of structure would write more unrelated details. From each of the protocols two scores were computed. The first reflected each student's level of awareness of the author's structure as measured on a scale of 1 to 7, categorizing student responses as indicators of full, partial or no awareness of structure. The second indicated the percentage of main idea units and detail idea units to total idea units recalled.

Passage familiarity. To control for degree of passage familiarity, all passage topics were from materials used in the sixth grade classes participating in the study. In order to determine the effect of passage familiarity on entry level, rate of growth and performance on the sustained effects tests, prior to reading each passage used in the assessment measures, students were asked to free associate in writing to key words or phrases representing major concepts in each passage. The associations were then classified into one of three levels of knowledge using a procedure developed by Langer (1984), found to correspond to students' levels of subject knowledge. The mean levels of passage familiarity appeared to follow the same pattern for both groups. That is, when passage familiarity was low for

the Treatment Group, it was also low for the Control Group. Similarly, it if were high for the Treatment Group, it was also high for the Control Group.

Analysis Procedure. Traditionally, experiments involving text structure instruction have been two-wave studies whose treatment effects have been determined by pre-and posttest differences in the means of the experimental and control groups. The results of the studies have provided us only with information on observed changes in group status from the initial point to the final point using a difference score with no internal estimate of error. These studies have not measured learning or change nor have they provided a picture of inter-individual heterogeneity in growth (Willett, 1994, 1988). In addition, they have failed to tell us whether subjects tested on one occasion differ in their relative positions to others on the second occasion and if so, why. In text structure interventions, without an estimate of the inter-individual heterogeneity in growth, we have not had a way to test hypotheses about the effect of these interventions on the structure of growth curves or to understand the effect of correlates of change, such as reading level or level of knowledge of author's top-level structure (Bryk & Raudenbush, 1992; Raudenbush & Bryk, 1988).

Taking a multi-level, longitudinal perspective and using a hierarchical linear model instead of traditional pretest/posttest analysis corrected for these shortcomings and generated summary statistics for the questions being investigated. This was accomplished by estimating within-subject rates of change on the outcome variables and then testing whether between-subject differences in the rates of change were systematically related to participation in the intervention, controlling for the students' backgrounds. Further, the between-subject stage enabled testing for differences in treatment effects by

skill level of readers, initial status and passage familiarity as well as interactions between these background characteristics and growth over time. These analyses were conducted using the statistical program, HLM (Bryk, Raudenbush, Seltzer, & Congdon, 1989).

Analysis

Pretesting. At the beginning of the trimester all of the students were pretested for awareness of the comparison/contrast and cause/effect rhetorical structures, recall of main idea and detail idea units, and comprehension. There were no statistically significant differences between the groups on any pretest means.

Students in the Treatment Group showed significant improvement over time on all measures. In contrast, the growth of students in the control group on average was either negative or negligible and insignificant, depending upon the variable.

The study examined the influence of certain measurable background characteristics on levels of structure awareness and percentage of idea units remembered. These characteristics, i. e., reading level, passage familiarity and initial status uniformly influenced students pretest scores but did not influence their rate of growth.

Levels of structure awareness. Pretesting results indicated that in general, on three levels of structure awareness, i. e, *none*, *partial* and *full*,[1] students entered the study having borderline partial awareness of the comparison/ contrast structure and no awareness of the cause/effect rhetorical structure. As seen in Figures 1 and 2, after participating in the

[1]Structure awareness was measured on a seven-point scale. For comparison/contrast 0-2=no awareness, 3-4=partial awareness and 5-7 full awareness. For cause/effect 1-3=no awareness, 4-5=partial awareness and 6-7 =full awareness.

intervention, students in the Treatment Group on average closely approached full awareness of the comparison and contrast structure and achieved high partial awareness of the cause and effect structure. Students in the Control Group did not move from their entry-level categories.

Recall of comparison and contrast idea units. The recall protocols were analyzed not only for level of structure awareness but also for the number of ideas units recalled. Figure 3 shows that on the idea unit variable of interest, combined levels one and two main idea units, the Treatment Group showed a small but consistent upward trend for the comparison/contrast structure while the Control Group actually declined during the period of the intervention. For cause/effect, as seen in Figure 4, the Treatment Group showed an upward growth pattern followed by a decline on the sustained effects test. Once again the Control Group scored consistently below its initial status level until the sustained effects test when, in contrast to the Treatment Group, it showed a slight increase over its initial status score.

Findings from previous research indicating that exposure to text structure without direct instruction is insufficient for developing schema for strategic use were supported by the Control Group's failure to achieve higher levels of structure awareness. The Control Group engaged in a number of procedures thought to aid comprehension and recall. They read all of the passages used in the intervention with the Treatment Group. Before reading the passages, they predicted what they would learn from the passage. In addition they discussed any vocabulary words or concepts critical to understanding the passage. Students then read the selection, wrote answers to the questions about the selection and had a follow-up discussion. Their discussions did not focus on the rhetorical structure in which the passages were written;

Figure 1. Differences in comparison and contrast structure awareness for the Control Group and The Treatment Group by testing time with reading level held constant at 55 NCE's and passage familiarity held constant at 4.5

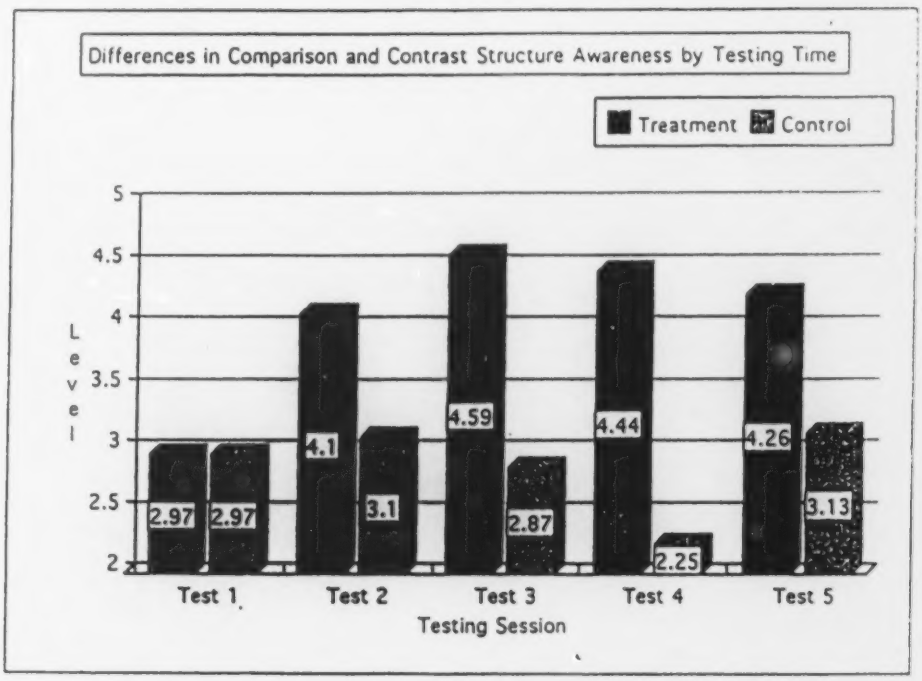

Figure 2. Bar graph of estimated cause and effect structure awareness level for the Treatment Group and the Control Group by testing time with reading level held constant at 55 NCE's and passage familiarity held constant at 4.5

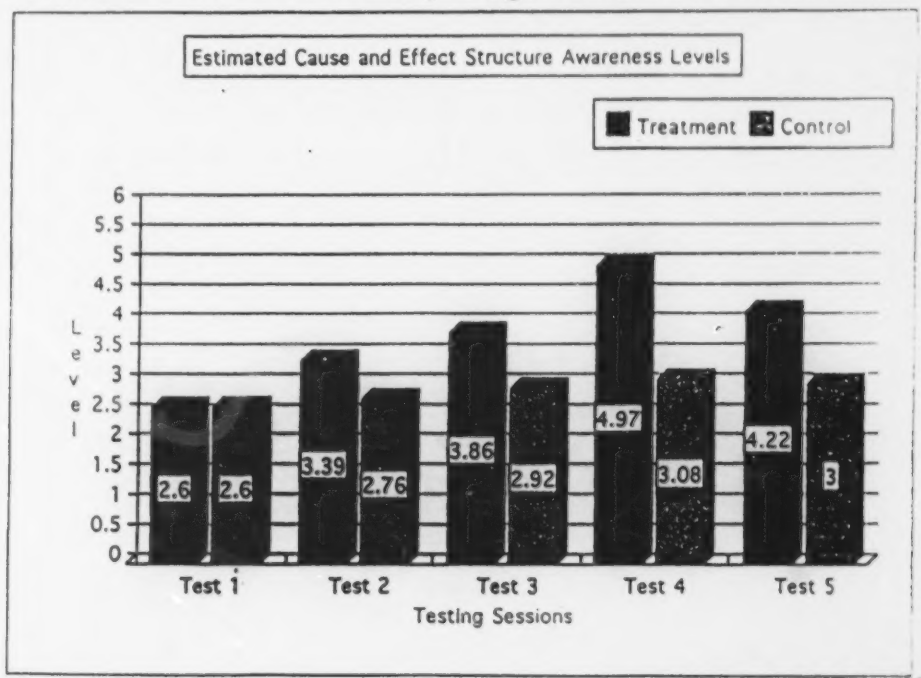

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Figure 3. Estimated percentage of comparison and contrast LVL1&2 main idea units recalled with reading level held constant at 55 NCE's, passage familiarity at 4.5 and initial structure awareness at 4.

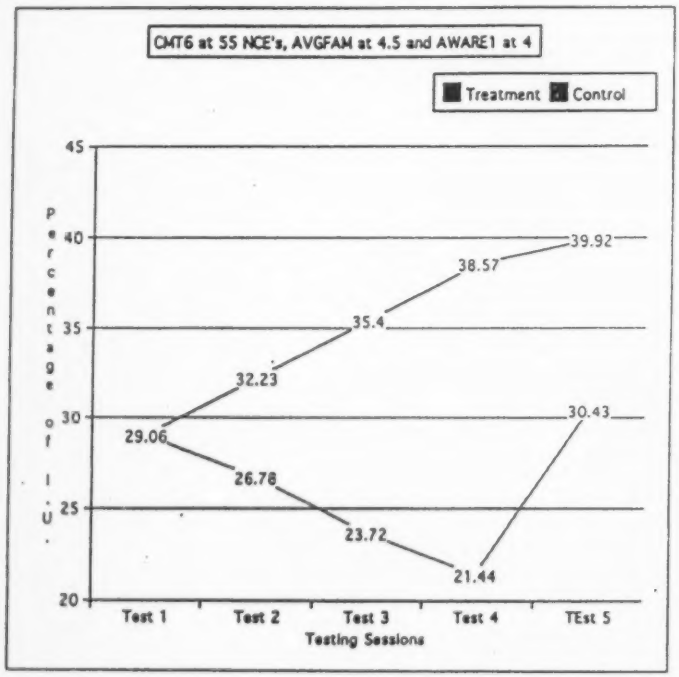
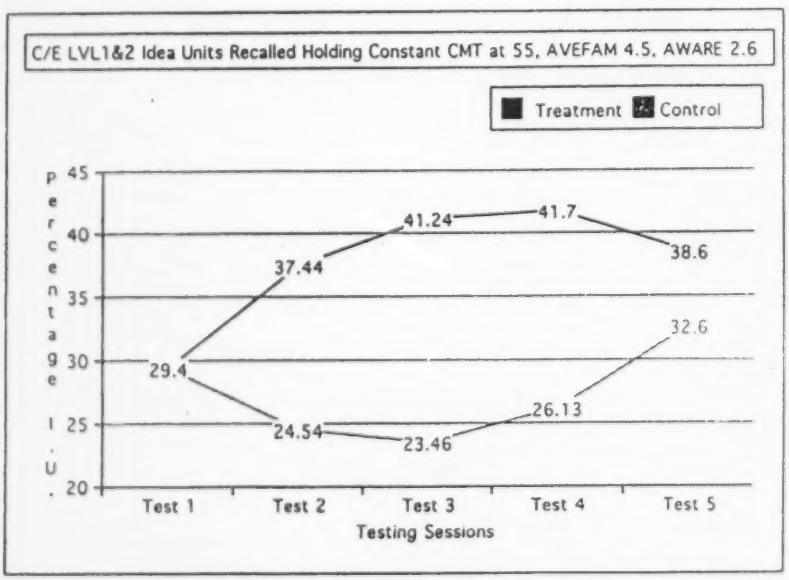


Figure 4. Estimated percentage of cause and effect LVL1&2 main idea units recalled holding reading level constant at 55, passage familiarity at 4.5 and structure awareness at 2.6.



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yet indirectly discussions had to encompass either the comparison or the causation relationships implicit in the organization of the selection' s content.

The benefits from following these procedures appear to have been passage specific. That is to say, the activities created interest in the content of the passages and possibly expanded students' knowledge of the topic. However, the benefits did not appear to transfer to the writing of recall protocols on new material.

The Treatment Group's performance confirms the viability of designing instruction to raise levels of structure awareness. The Treatment Group, having been taught the characteristics of the rhetorical structure as well as a strategy for employing it in their reading and writing, showed a significant increase in levels of awareness. When writing recall protocols, they included the superordinate ideas of the passages they had read, some elaboration of these ideas and key words generally used to signal the relationships implicit in the structure.

The results of this study replicate findings of other experiments whose purpose was to raise students' level of text structure awareness (Armbruster, Anderson & Ostertag,1987; Richgels & McGee, 1989; Taylor & Beach, 1984.)

Background Characteristics

Reading level. Differences in performance by reading level were evident on the pretest. Students with higher reading scores tended to have higher levels of structure awareness or to use more top-level idea units than students with lower reading levels. However, reading level did not affect the rate of growth. Students with lower reading levels, as measured by a standardized test, in general grew at the same rate as those with higher reading levels. Although there was considerable variation by reading level in the number of idea units recalled, good readers tended to include more

top-level idea units in their protocols than poor readers. But even with good readers, in general the number of top-level idea units recorded is cause for concern. For the poor reader the concern is even greater.

It is difficult to know whether the number of idea units recorded reflected the true status of recall or whether it reflected the skill in writing or perhaps even the willingness to write. This is a question that can be asked about the performance of all levels of readers, but since poor readers also tend to be poor writers, poor readers may have had the additional disadvantage of having to struggle to encode the messages of the passage in the recall protocols. Even if there were difficulties in writing or a reluctance to write, for students in the Treatment Group there was still a greater increase in the number of idea units over the course of the intervention than there was for the Control Group.

Passage familiarity. Considerable research has been conducted on the role of background knowledge in reading comprehension, and a body of evidence suggests that when students know more about a subject, they are better able to comprehend and remember passages containing new information about the topic (Spyridakis & Wenger, 1991; Roller, 1990; Langer, 1984). Studies which have examined the role of passage familiarity in the success of text structure interventions have found that students utilize strategies taught in the intervention when passages were moderately unfamiliar (Taylor & Beach, 1984). If the passage were too unfamiliar, students' cognitive resources went into making sense of the new material, leaving little left over for retrieving information. Thus it was important to know whether scores on the passages used for recall would be impacted by differences in passage familiarity scores.

According to the categories on the Langer rating scale, overall students had some background knowledge about the major concepts in the passages. Students with higher levels of passage familiarity scored higher on the pretest than did those with lower levels. In fact, passage familiarity had an even greater impact on initial status than did reading level.

But the level of passage familiarity did not affect the learning rate. One interpretation of this finding is that passage familiarity assisted in the processing of expository text to a point. However, students' developing schemata for structure enabled them to go beyond what they could do when utilizing just background knowledge. Without schemata for the two structures, there was little change in the Control Group's scores and the rate of learning was close to zero.

The findings suggest that knowledge about a topic is not sufficient. There must also be a schema for a text's structure. The data further suggest that schema for a text structure can compensate for low levels of passage familiarity.

Initial status of structure awareness and rate of growth of percentage of idea units. I wanted to know if students' initial awareness of structure would influence their rate of growth in the percentage of top-level idea units remembered. The findings for both structures indicate that it did not. There was an expected relationship between inital level of structure awareness and initial scores for percentage of idea units remembered, but not for rate of growth. The influence of structure awareness was felt in the same way as the influence of higher reading levels and higher levels of passage familiarity. Students with higher structure awareness scores entered with a higher percentage of top-level idea units remembered. Starting at a higher level, their rate of growth enabled them ultimately to remember more idea units

than someone starting at a lower level. However, the rate of change for what they remembered was not affected by their initial level of structure awareness.

Sustained Effects

Very few studies in text structure awareness have included sustained effects testing as part of the design (Richgels & McGee, 1989; Armbruster, Anderson & Ostertag, 1987; Taylor & Beach, 1984). The implications of the sustained effects found in this study are not conclusive and invite further exploration.

On the surface the sustained effects results from hierarchical linear modeling present a somewhat negative picture if one doesn't consider what the numbers actually reflect. The results show a negative deviation from the *projected* growth trajectory for the Treatment Group and a positive deviation for the Control Group. The difference is understandable considering that the Control Group, for the most part, experienced negative growth during the treatment. Therefore its predicted "next text" score was a negative one. However, the Control Group returned to or just slightly above its pretest scores, making its departure from the growth trajectory appear positive. In contrast, the Treatment Group had a positive growth trajectory. To follow its course, the predicted "next test" score should have been a positive one. However, additional growth was not anticipated for the Treatment Group after the intervention's end. Thus the predicted score showing an increase was not representative of what was expected for a sustained effects result.

The question that arises from these sustained effects results is why there was a reversal of the negative growth for the Control Group on the sustained effects test so that the Control Group returned to or just slightly exceeded its pretest scores? There is a slight possibility that passage familiarity

influenced the direction. Of all the passage familiarity scores for the recall tests, the Control Group achieved its two highest on the two sustained effects tests (5.21 and 5.88 out of 9). For the comparison/contrast sustained effects test the difference in passage familiarity between the two groups was the only one to be significantly difference for all of the passages (5.21 for the Controls and 3.74 for the Treatment Group). The levels of passage familiarity, either by themselves or in combination with the environmental testing conditions for the Control Group may have influenced the direction of its sustained effects scores.

Limitations of the Study

A limitation of this study is that is does not separate out the effect of two key components, collaboration and the integration of reading and writing. Thus we don't know if the inclusion of one without the other would have achieved similar results or if it were the combination of the two that contributed to any successes realized by participation in the intervention.

A second limitation of this intervention is that students were exposed only to short passages for instruction and assessment. We have no way of assessing the amount of carryover to the longer passages in their content area text books. Similarly, another shortcoming is that each passage had been carefully constructed to reflect only one rhetorical structure. Again we have no information on the transfer to passages containing mixed rhetorical structures.

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